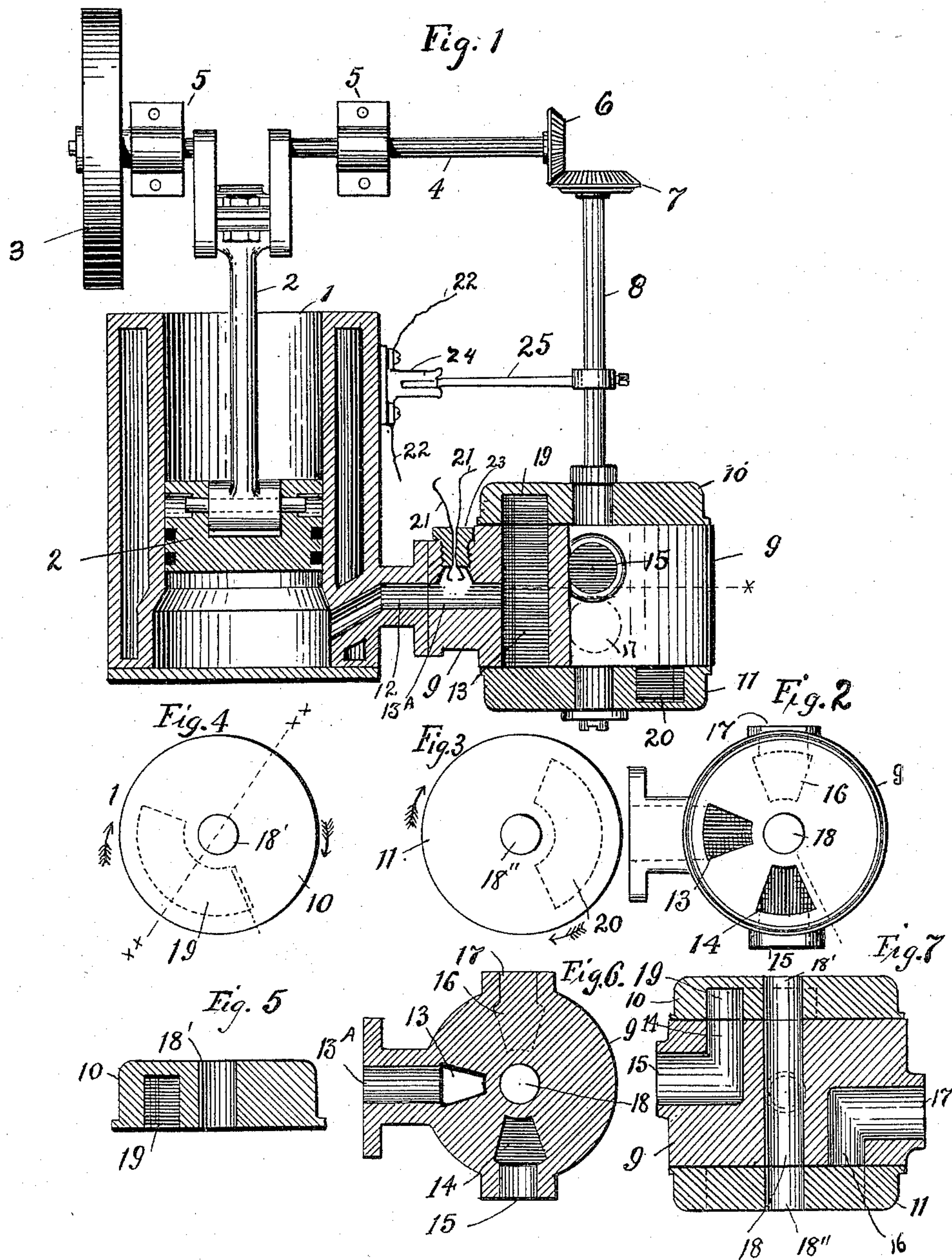


(No Model.)

E. W. EVANS.  
GAS ENGINE.

No. 488,165.

Patented Dec. 13, 1892.



Edmund W. Evans  
INVENTOR

WITNESSES:  
Homer A. Berry.  
Daniel Brittain

BY John P. Kelly Jr.  
His ATTORNEY.



# UNITED STATES PATENT OFFICE.

EDWIN W. EVANS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE  
EVANS GAS ENGINE COMPANY, OF NEW JERSEY.

## GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 488,165, dated December 13, 1892.

Application filed July 9, 1892. Serial No. 439,549. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN W. EVANS, of the city and county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Gas-Engines, of which the following is a specification, due reference being had to the accompanying drawings, which illustrate my invention.

My invention has reference generally to engines, particularly to that class known as "gas-engines," for power purposes, and has special reference to a construction and operation of a rotary or balance valve that combines the principles of mixing, condensing, ignition, and exhausting, and has for its object cheapness and durability in construction and operation, efficiency in timing, and avoiding the use of eccentrics and cams; and to the end sought it consists of the novel features of construction, &c., hereinafter described, and pointed out in the claims.

In the drawings which illustrate my invention, Figure 1 is a view, partly in vertical section, of the valve and its connected piston, piston-cylinder, &c., embracing my invention, the parts being represented in position to take in a charge of gas. Fig. 2 is a top plan view of the valve-body or stationary portion of the valve, the exhaust-port therein being shown in dotted lines. Fig. 3 is a view of the bottom balance-valve, showing in dotted lines the gas-pocket therein. Fig. 4 is a similar view of the top balance-valve. Fig. 5 is a vertical section of the same, taken on the line *xx xx*. Fig. 6 is a view in cross-section of the valve-body, taken on the line *xx xx*, Fig. 1, the upper balance-valve being removed; and Fig. 7 is a vertical sectional view of the entire valve, looking toward the piston-cylinder.

Referring to the drawings, in which the parts are indicated by numerals, similar numerals denoting like parts wherever used, 1 is the piston or compression chamber, and 2 the piston and its rod; 3, the power-transmitting wheel; 4, the horizontal shaft to which the piston is geared; 5, means shown for supporting the shaft, and 6 a gear-wheel on the extremity of the said shaft. This gear-wheel 6 meshes with a larger gear 7, mounted on the upper extremity of a vertical shaft 8, which is suitably attached to the rotary por-

tions 10 11 of the valve and rotated by the working of the piston and the intermediate gearing for purposes hereinafter more fully explained.

The chamber 1 is in open communication with the valve-body 9 by means of the ports 12 13<sup>A</sup>, the valve-body 9 being stationary, while the balance-valve portions thereof 10 11 are keyed or otherwise suitably mounted on the shaft 8 and rotate therewith. The valve-body 9 is preferably cylindrical in outline, having flat upper and lower surfaces, against which the rotary portions 10 11 of the valve work, and a central opening 18 for the shaft 8. A port 13 extends vertically through the valve-body 9 and is in open communication with the port 13<sup>A</sup>, and this valve-body 9 is further provided as to its upper face with a port 14, hereinafter termed the "mixing-port," which extends partially only through said body portion 9 and is in open communication with the gas-inlet port 15, and as to its lower face with a similar port 16, hereinafter termed the "exhaust-port," which is in open communication with the outlet-port 17 and shown in dotted lines in Figs. 2 and 6 of the drawings. These ports 13, 14, and 16 are located at each quarter-point relative to the circumference of the body portion 9, the fourth quarter-point being blank or presenting a solid or closed surface. The upper and lower valve portions 10 and 11 are alike in construction, Figs. 1 and 5, each having a central opening 18' 18'', respectively, for the shaft 8 and a gas-pocket 19 20, respectively, (shown in dotted lines, Figs. 3 and 4,) for purposes presently explained, and are rigidly mounted on the shaft 8 in place on the body portion 9, as clearly shown in Fig. 1 of the drawings, Figs. 4 and 3 showing the relative positions of the pockets 19 20 with regard to the ports 13, 14, and 16 in the body portion 9 of the valve when the valve is in position to take in a charge of gas, the dotted line *y*, Figs. 2 and 4, indicating the overlap of one end of the pocket 19 of the upper valve with the mixing-port 14, and its other end is then in open communication with the port 13 to the cylinder 1, while the pocket 20 of the lower valve is closed to the ports 13 and 16, the arrows, Figs. 3 and 4, indicating the direction of rotation.



In connection with my engine I have shown electrical means for igniting or exploding the charge of gas for the obtaining of the necessary automatic continuous operation and power-transmitting features of the engine, and to this end the wires 21, which are supplied with a battery, sparker, &c., (not shown,) conveniently lead into the port 13<sup>A</sup>, through a plug 23. Other wires 22 to complete the circuit connect with a contact-arm 24, mounted on and projecting from the side of the cylinder 1, while a finger 25 is mounted on the shaft 8 and so set relative to the rotation of the valve as to make and break circuit at the ending of the second quarter-turn of said valve from the beginning of the taking in of the charge of gas. Thereby the charge of compressed gas may be timely exploded or expanded.

Having now fully described the several parts of my invention, the operation is as follows: The cylinder 1 and valve-body 9 being connected so that the port 12 of the former and ports 13 13<sup>A</sup> of the latter form a single port or open communication between said cylinder and valve, the balance-valves 10 and 11 suitably mounted on the shaft 8 and in proper position on the valve-body 9—that is to say, the pocket 20 of the balance-valve 10 open to both the ports 13 and 14 and overlapping the port 14 to the extent as indicated by dotted line *y* of Figs. 2 and 4 and the balance-valve 11 closed to the ports 13 and 16—the piston 2 at low-center, the gears 6 and 7 meshing, (the gearing being such as to cause the balance-valves 10 and 11 to each make a quarter-turn to each stroke of the piston,) and the port 15 having a connected source of gas-supply, there then being a continuous open passage between the inlet-port 15 and cylinder 1, the engine is ready to be started. (See Fig. 1.) The wheel 3 is given a turn by hand, when the piston 2 will at once commence to ascend and the valves 10 and 11 to rotate, the pocket 19 in valve 10 gradually closing to the mixing-port 14 and simultaneously taking in a charge of gas, which flows through the ports 15 14 into the pocket 19, then downward through the port 13 to the ports 13<sup>A</sup> 12, and thence passing into the cylinder 1. This operation continues until the balance-valves have made a quarter-turn, at which time the pocket 19 will be closed to the mixing-port 14, the charge of gas taken in, and the piston be at top-center—that is to say, have made a full stroke. The piston now travels toward low-center, compressing the charge of gas, and so continues until a complete second stroke has been made, at which time the valves have completed a second quarter-turn and are now closed to the various ports in the valve-body 9. At this instant the finger 25 forms electrical contact with the arm 24, and thereby ignites and explodes the charge of compressed gas, causing the piston to rapidly ascend to top-center again, thus giving momen-

tum and increased power to the driving-wheel 3 through the intermediate gearing and from there transmitted in a manner well understood. At this time the piston will have made its third stroke and the valves completed their third quarter-turn. The pocket 19 is still closed to the port 13, while the pocket 20 in the lower balance-valve 11 is now open to the ports 13 and 16 of the valve-body 9 and completely exhausts the exploded gas as the piston travels toward and again reaches low-center to make its fourth stroke, at the completion of which the valves will have made their last quarter-turn and the parts be again in position to take in a new charge of gas and repeat the operation of mixing, compressing, exploding, and exhausting charges of gas for power generation.

Having thus described my invention, I wish it understood that I do not desire to limit myself to the exact construction of parts shown in the accompanying drawings and herein described, but may vary the same in any manner to better carry out the principle of my invention without departing from the true scope thereof.

I claim—

1. In a gas or other engine, the combination, with the piston-cylinder, piston, and its connected power-transmitting gearing, of a balance-valve consisting of a fixed body portion having a combined supply and mixing port, a combined exhaust and outlet port, and combined port communication with the piston-cylinder and two movable portions, one on each side of said fixed portion, mounted on a shaft extending through the latter and rotating therewith, each of said movable portions provided with a pocket adapted to communicate with their respective ports in the fixed portion at predetermined intervals, as described.

2. In a gas-engine, a balance-valve of the character herein described, consisting of a fixed body portion having a combined supply and mixing port, a combined exhaust and outlet port, and combined port connection with the compression-cylinder, two movable portions, one on each side of said fixed portion, mounted on a shaft extending through the latter and rotating therewith, each of the said movable portions provided with a pocket adapted to communicate with their respective ports in the fixed portion at predetermined intervals, and means for timely exploding a charge of gas when taken into the engine, whereby a charge of gas may be taken into the engine and in turn compressed, exploded, and exhausted, for the purposes set forth.

In testimony whereof I have hereunto signed my name this 5th day of October, A. D. 1891.

EDWIN W. EVANS.

In presence of—

JOHN JOLLEY, Jr.,  
F. MITCHELL.